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Social Resilience and Economic Strengthening Model Based on Farmer Empowerment in Coastal Areas of Deli Serdang Regency, North Sumatra Indonesia

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The study examined farmers' economic resilience, social resilience, and empowerment during and after the COVID-19 epidemic. Additionally, it aimed to determine how social, environmental, physical, and social capital affected farmer empowerment to improve farmers' social and economic resilience in the Deli Serdang Regency's coastal area during the COVID-19 pandemic. It was Deli Serdang Regency where the investigation was conducted. The study discovered that 28,346 farmer households were impacted, either directly or indirectly, as a result of the COVID-19 pandemic. Using the Slovin composition, the sizes of the components consisted of 177 ratios. Path analysis and the paired sample t-test were implemented to undertake descriptive analysis, which incorporated both primary and secondary data. The study's findings back up the following conclusions: a) farmers in Deli Serdang Regency's coastal areas had different levels of economic strength, social resilience, and farmer empowerment during and after the COVID-19 pandemic, where; empowerment post pandemic is better with an average score of 4.2723 higher than during the COVID-19 pandemic with an average score of 3.8927; social resilience after the COVID-19 pandemic is better with an average score of 4.5751 compared to the pandemic period with an average score of 4.3977 and economic strength of farmers after the pandemic is better with a value of 4.4966, better than during the pandemic with a value of 4.3662; b) social capital, environmental physical capital, and financial capital through farmer empowerment had an effect on farmers' social resilience in those areas following the pandemic; and c) the development of farmers' economic strength in Deli Serdang Regency's coastal districts during the COVID-19 epidemic was influenced by social capital, environmental physical capital, and financial capital via farmer empowerment. In light of this study's results, it is advised that the Government empower coastal communities in a planned and sustainable way to boost economic and social resilience by making the most of the community's resources, including financial, environmental, and social capital.
Keywords: Economic strengthening, empowerment, coastal area, farmers, social resilience.

INTRODUCTION

During the 2019 COVID-19 epidemic, people's lives were negatively impacted in every way (Ranasinghe et al., 2020); the economic structure of society changes (Chakraborty and Maity, 2020), business and consumer behavior also experienced changes (Donthu and Gustafsson, 2020) and causes social inequality (Gopalan and Misra, 2020). The pandemic also caused unemployment (Furman et al., 2020) which affects all facets of society, regardless of whether they are urban or rural (Haque et al., 2020). Deli Serdang Regency is an area in North Sumatra that has experienced the second largest impact of COVID-19 after Medan City (Efendi, 2020). The economic vulnerabilities that occurred for farmers during the COVID-19 pandemic in the coastal areas of Deli Serdang Regency were the suboptimal use of equipment or economic assets, increased equipment maintenance costs, waste of agricultural products and a reduction in farmers' income due to the cessation of the production process.

The activities of coastal communities have also been influenced by the pandemic (Bennett et al., 2020) which includes; agricultural activities, shop businesses, farm laborers and fishermen (Roy et al., 2016). Activity the economy of coastal communities generally depends on

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geographical-ecological, socio-cultural characteristics (Sekarningrum and Yunita, 2019) which causes activities. The COVID-19 pandemic has had a negative impact on the social conditions of farmers in Deli Serdang Regency, which is marked by a decrease in the frequency of social interactions between farmers by 81.8% per month and a decrease in the frequency of visits and meetings between farmer families and relatives by 74.7% per month during the COVID-19 pandemic (Nainggolan et al., 2022).

The socio-economic community is vulnerable to disasters, such as the COVID-19 pandemic. Social vulnerability also occurs in the coastal areas of Deli Serdang Regency, especially for low-income farming families, women and children, people with disabilities, and the elderly. The Covid-19 pandemic also causes social vulnerability in the form of disrupted social activities, increasing the number of poor families and social inequality. The epidemic has also influenced the decrease in Deli Serdang Regency's economic growth rate from the COVID-19 pandemic to 2022 (BPS, 2023).

The emergence of socio-economic impacts on farmers due to disasters must be addressed properly (Olshansky and Chang, 2009). Private institutions, communities, the world of education including the government can make various efforts for the socio-economic recovery of the community (Mehta, et al., 2020) for example; training, empowerment for the community, improving education and skills. Coastal areas which are generally rich in natural resources such as; mangrove forests, coral reefs, seaweed, fishery resources, should be able to support the income of its people, especially in difficult times. The reality is that these resources have not been optimized properly due to limited technology, capital and low farmer education (Nainggolan, et al., 2021).

Empowerment is a strategic step to change the socio-economic conditions of society, towards increasing income and welfare (Durán-Díaz et al., 2020), as well as to reduce the gap between communities (Surya et al., 2021) which is oriented towards strengthening institutional capacity, business development (Afrin et al., 2022), socio-economic strengthening (Coaffee et al., 2018), including creating food security (Nainggolan et al., 2019). The empowerment process aims to make the community independent so that they are able to improve their standard of living by using and accessing resources optimally.

On the one hand, weak human resource capacity, non-functioning village institutions and non-functioning coastal farmer networks are the causes of poor community welfare, especially during disasters like the COVID-19 epidemic (Dunggio et al., 2021). Low income and welfare of farmers and the failure of empowerment are problems that must be resolved to create social resilience and strengthen the economy of coastal farmers. Social resilience describes the ability of farmers to maintain their condition against economic uncertainty (Delima et al., 2016). Social resilience is also influenced by government policies and programs (Elrick-Barr et al., 2024), community assets, income, physical factors, political and social capital (Teräs, 2019) including social change.

On the other hand, coastal communities are also very vulnerable to economic resilience caused by various factors. The system's and the community's economic capability to adjust to changes is known as economic resilience (Febriyanti et al., 2021). Economic resilience describes the economic stability of society (Zhou et al., 2019) with indicator; per capita income, ownership of social capital, environmental capital, financial security and health (Shahreza and Lindiawatie, 2020), and low human resources and technology, low competitiveness of agricultural products also affect the economic strength of farmers. According to the above description, this study aims to compare farmers' economic strength, social resilience, and farmer empowerment during and after the COVID-19 pandemic. Furthermore, a model will be developed to improve the livelihoods of farmers in the littoral region of Deli Serdang Regency, North Sumatra Province, by investigating the impact of physical environmental capital, social environmental capital, and social capital on farmer empowerment. This model will be designed to increase social resilience.

MATERIALS AND METHODS

***Research Type and Location*:** This research is descriptive in nature with a quantitative and qualitative approach, to reveal facts in the field objectively, accurately and systematically in order to describe the relationship between the phenomena analyzed (Ilsan and Amran, 2022). Descriptive research is an exploratory research method, where researchers will describe the population, conditions, or phenomena precisely and accurately. Descriptive research describes the characteristics of the group, situation, or phenomenon being studied using surveys, observational studies, case studies and other forms (Afrin et al., 2022).

The study was carried out in North Sumatra's Deli Serdang Regency. One of the sectors negatively impacted by COVID-19 in 2020 was the research field. There are 4 out of 22 sub-districts in this region as coastal areas, namely; Sub-district of Hamparan Perak, Percut Sei Tuan, Pantai Labu and Labuhan Deli (BPS, 2021). Research and data collection were conducted in 2 area, namely Sub-districts of Percut Sei Tuan and Sub-districts of Hamparan Perak.

***Population and Research Sample*:** The research population consisted of farmers in the coastal regions of Deli Serdang Regency who were directly or indirectly impacted by COVID-19 in 2020. Specifically, this included 12,178 farming families in the Percut Sei Tuan District and 16,168 farming families in the Hamparan Perak District, totaling 28,168 farming families. The data collection site was selected

due to the abundance of cultivators in the littoral regions of Deli Serdang Regency. The study's sample was determined through the application of both qualitative and quantitative methodologies (Nurdiani, 2014). The Slovin formula is employed to as certain the quantity of the research sample;

$$n_c = N/[1 + Ne^2] \quad (1)$$

where e = error interval (∞ = 7.5%, N = population), nc = sample size.

Based on the calculation, 176.67 samples were obtained, rounded up to 177 respondents from 28,168 populations. Samples in 2 sub-districts were determined proportionally, namely in Hamparan Perak Sub-district 101 respondents and Percut Sei Tuan 76 respondents.

***Data Sources and Data Analysis Methods*:** This research includes primary data from focus group discussions (FGD), questionnaire-based interviews, and surveys. Research findings, publications, the Central Statistics Agency (BPS), and the Marine and Fisheries Service of Deli Serdang Regency were secondary data sources. To find out the comparison of farmer empowerment, social resilience conditions and economic strength of farmers during and after the COVID-19 pandemic; descriptive analysis was used by comparing during and after the epidemic COVID-19 using a paired sample t-test. Then to produce a model of the influence of social capital, physical environmental capital, social environmental capital on farmer empowerment in order to increase social resilience and strengthen the economy of farmers after the COVID-19 pandemic in the coastal area of Deli Sedang Regency, path analysis was used with the following formula;

$$Y_1 = a + b_1X_1 + b_2 X_2 + b_3 X_3 + e \quad (2)$$

$$Y_{2.1} = a + b_1X_1 + b_2 X_2 + b_3 X_3 + Y_1 + e \quad (3)$$

$$Y_{2.2} = a + b_1X_1 + b_2 X_2 + b_3 X_3 + Y_1 + e \quad (4)$$

Where: Y_1 = Community empowerment; $Y_{2.1}$ = Social resilience; $Y_{2.2}$ = Economic; X_1= Social capital; X_2 = Environmental physical capital; X_3= Economic capital.

Interventionary studies involving animals or humans, and other studies that require ethical approval, must list the authority that provided approval and the corresponding ethical approval code. In this study, validity and reliability tests were conducted. Validity tests are conducted to determine whether an instrument is valid or not in measuring a research variable. An instrument from a questionnaire is said to be valid if the instrument can accurately measure what it is intended to measure. In addition to the instrument, there are factors that affect the validity and reliability of a measuring instrument. Instruments are the use of measuring instruments in measurement and the subject being measured. A measuring instrument can be said to have high validity if the instrument can carry out its measuring function, or provide measurement results that are in accordance with the purpose of the measurement.

RESULTS

***Comparison of Farmer Empowerment, Social Resilience Conditions and Economic Strength of Farmer Families During and After the COVID-19 Pandemic*:** Comparison of Farmer Empowerment During and After the COVID-19 Pandemic.

Tables 1, 2, and 3 compare farmer empowerment in Deli Serdang Regency's coastline areas before and after the COVID-19 epidemic, according to the data analysis findings using the paired sample t-test:

Table 1. Paired Samples Statistics

Paired Samples Statistics				
	Mean	**N**	**Std. Deviation**	**Std. Error mean**
Pair 1 EDC	3.8927	177	0.39081	0.02937
EPC	4.2723	177	0.31147	0.02341

Source: Primary data, processed 2024.

Table 1 indicates that in Paired Samples Statistics, the descriptive statistical results of Empowerment During COVID-19 (EDC) and Empowerment Post-COVID-19 (EPC) are shown. The average score for Empowerment During COVID-19 (EDC) is 3.8927, and the average score for Post COVID-19 Empowerment (EPC) is 4.2723, with a sample of 177 respondents. The standard deviation for Empowerment during COVID-19 (EDC) is 0.39081 and the standard deviation for post COVID-19 empowerment (EPC) is 0.31147.

Table 2. t-Test Paired Samples Correlations.

Paired Samples Correlations				
		N	**Correlation**	**Sig.**
Pair 1	EDC & EPC	177	0.087	0.252

Source: Primary data, processed 2024.

The findings of the Paired Samples Correlations between the two variables, Empowerment during COVID-19 (EDC) and Post-COVID-19 Empowerment (EPC), are shown in Table 2. The correlation score is 0.877, and the degree of significance is 0.252. Since the value of 0.252 is more significant than 0.05, the criteria indicate no correlation between the data on empowerment during COVID-19 (EDC) and post-COVID-19 empowerment (EPC).

***Comparison of Farmers' Social Resilience During and After the COVID-19 Pandemic*:** As shown in Tables 4, 5, and 6, farmers' social resilience in the Deli Serdang Regency's coastal regions was compared before and after the COVID-19 epidemic, according to the data analysis findings using the paired sample t-test:

Table 3. Paired Samples T Test.

Paired Samples Test									
		Paired Differences					t-value	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the difference				
					Lower	Upper			
Pair 1	EDC - EPC	-0.3797	0.4782	0.0359	-0.4506	-0.3087	-10.563	176	0.000

Source: Primary data, processed 2024.

Table 4. Paired Samples Statistics.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	RDC	4.5751	177	0.39291	0.02953
	RPC	4.3977	177	0.36243	0.02724

Source: Primary data, processed 2024.

Table 5. Paired Samples Correlation.

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	RDC & RPC	177	0.446	0.000

Source: Primary data, processed 2024.

Table 6. T Test Paired Samples Test.

Paired Samples Test									
		Paired Samples Test Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	RDC-RPC	0.1774	0.3982	0.0299	0.1183	0.2365	5.927	176	0.000

Source: Primary data, processed 2024.

Table 7. Paired Samples Statistics.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	ESDC	4.3662	177	0.23874	0.01795
	ESPC	4.4966	177	0.26214	0.01970

Source: Primary data, processed 2024.

Table 4 shows that Paired Samples Statistics shows the descriptive statistical results of Social Resilience during COVID-19 (RDC) and Social Resilience Post COVID-19 (RPC). Social resilience during COVID-19 (RDC) has an average score of 4.5751, whereas it has an average score of 4.3977 in the post-COVID-19 era (RPC). This information is based on a sample size of 177 respondents. The standard deviation for Social Resilience during COVID-19 (RDC) is 0.39291 and the standard deviation for Social Resilience Post COVID-19 (RPC) is 0.3623.

In the Paired Samples Correlations, Table 5, the correlation or relationship between the two variables Social Resilience during COVID-19 (RDC) and Social Resilience Post COVID-19 (RPC) is demonstrated with a correlation score of 0.446 and a significance coefficient of 0.000. According to the criteria because the value of 0.000 <0.05, the results show a relationship between the data of Social Resilience during COVID-19 (RDC) and Social Resilience Post COVID-19 (RPC).

***Comparison of Farmers' Economic Strength During and after the COVID-19 Pandemic*:** Delicatessen in Tables 7, 8, and 9, paired sample t-tests were used to examine the economic development of farmers in Serdang Regency's coastal districts before and after the COVID-19 epidemic.

Table 7 shows the Paired Samples Statistics showing the descriptive statistical results of Economic strength during COVID-19 (ESDC) and Economic strength post COVID-19 (ESPC). The average score for Economic strength during COVID-19 (ESDC) is 4.3662, and the average score for Economic strength Post COVID-19 (ESPC) is 4.4966, with a

Table 8. t Test Paired Samples Correlations.

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	ESDC & ESPC	177	0.712	0.000

Source: Primary data, processed 2024.

Table 9. Paired Samples T Test.

Paired Samples Test									
		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the difference				
					Lower	Upper			
Pair 1	ESDC–ESPC	-0.1304	0.1912	0.01437	-0.15875	-0.10204	-9.075	176	0.000

Source: Primary data, processed 2024.

Table 10. SPSS output results of the path coefficients of the influence of social capital, environmental physical capital, and financial capital on farmer empowerment.

Coefficients[a]											
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero order	Partial	Part
1	(Constant)	4.500	0.577		7.799	0.000	3.361	5.639			
	Social capital	0.069	0.109	0.148	0.632	0.028	0.283	0.146	0.047	0.048	0.048
	Environmental physical capital	0.032	0.065	0.039	0.498	0.619	0.096	0.160	0.031	0.038	0.038
	Financial Capital	0.015	0.052	0.122	0.283	0.037	0.118	0.088	0.017	0.022	0.021

a. Dependent Variable: Empowerment post COVID-19
Source: Primary data, processed 2024.

Table 11. Model Summary.

Model Summary[b]										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0.062a	0.704	0.0173	0.3136	0.004	0.221	3	173	0.882	2.862

a. Predictors: (Constant), Financial Capital, Social capital, Environmental physical capital
b. Dependent Variable: Empowerment post COVID-19
Source: Primary data, processed 2024.

sample size of 177 respondents. The standard deviation for economic strength during COVID-19 (ESDC) is 0.23874, while the standard deviation for economic strength post COVID-19 (ESPC) is 0.26214.

Table 8 displays the Paired Samples Correlations results of the relationship or correlation between the two variables, economic strength during COVID-19 (ESDC) and economic strength post-COVID-19 (ESPC). A correlation coefficient of 0.712 and a significance level of 0.000 are found by the data analysis. According to the criteria because the value of 0.000 <0.05, the results show a relationship between the data Economic strength during COVID-19 (ESDC) and Economic strength post COVID-19 (ESPC).

***The Influence of Social Capital, Environmental Physical Capital, Financial Capital on Farmer Empowerment in the Framework of Post-COVID-19 Social Resilience in Coastal Areas*:** Based on the results of data analysis, it is known that the SPSS output results are related to the influence of social capital, environmental physical capital, financial capital on farmer empowerment in the coastal area of Deli Serdang Regency as in Table 10.

The study results enumerated in Table 10 demonstrate that the community empowerment variable in the littoral region of Deli Serdang Regency in the post-COVID-19 era is significantly and positively influenced by the social capital variable (t-sig). The significance value is 0.028 (<0.05). The

community empowerment variable in the Deli Serdang Regency's post-COVID-19 coastal area is positively impacted by the physical environmental capital variable, as shown by Table 10's significant value of 0.619 (t-sig) (> 0.05). In the coastal region of Deli Serdang Regency during the COVID-19 pandemic, the financial capital variable significantly and favorably influences the farmer empowerment variable, according to data analysis results with a significance value of 0.037 (t-sig) (< 0.05). The research's conclusions align with the findings (Falah et al., 2022) which implies that social capital, environmental capital, and financial capital are critical components of the sustainability of community empowerment. The ultimate goal is to establish an autonomous community that can independently dictate the direction of community life without external interference. According to data analysis findings, the summary model is also known as the one shown in Table 11.

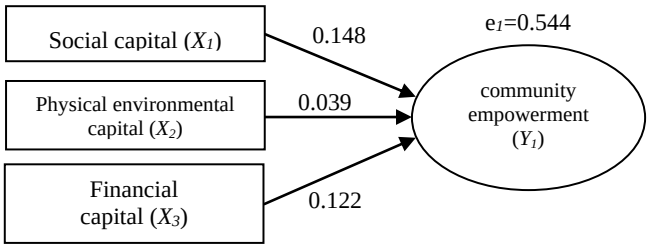

Figure 1. Model of the influence of social capital, environmental physical capital, financial capital on farmer empowerment in the coastal area of Deli Serdang Regency.

In the coastal area of Deli Serdang Regency, social capital, financial capital, and physical environmental capital all contributed 0.704 to community empowerment during the COVID-19 pandemic, according to Table 11's R Squarer value of 0.704. The e1 value may be found using the formula e1 = √ 1- 0.704 = 0.544. Figure 1 depicts the model 1 diagram in line with the study findings that are reported in Tables 10 and 11.

According to data analysis findings, the SPSS output results in the coastal region of Deli Serdang Regency are associated with social resilience based on farmer empowerment, as shown in Table 12.

As shown in Table 13, the SPSS model summary output findings are also known based on the data analysis outcomes. According to Table 13 Model Summary, the R Squarer value is 0.712, meaning that the variables of social capital, environmental, physical capital, financial capital, and community empowerment contributed 0.712 to social resilience in the post-COVID-19 coastal area of Deli Serdang Regency. The formula for calculating the e1 value is e1 = √ 1- 0.712 = 0.536. The diagram of model 1 of social resilience in the littoral area of Deli Serdang Regency, North Sumatra,

Table 12. SPSS output results of path coefficients of the social resilience model based on farmer empowerment in the coastal areas of Deli Serdang Regency.

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero order	Partial	Part
1	(Constant)	3.938	0.551		7.147	0.000	2,851	5.026			
	Empowerment post COVID-19	0.055	0.071	0.060	0.778	0.027	0.085	0.196	0.063	0.059	0.059
	Social capital	0.028	0.080	0.027	0.355	0.023	0.186	0.129	0.031	0.027	0.027
	Environmental physical capital	0.038	0.060	0.051	0.645	0.520	0.079	0.156	0.065	0.049	0.049
	Financial Capital	0.045	0.067	0.053	0.675	0.001	0.087	0.177	0.063	0.051	0.051

a. Dependent Variable: Social Resilience Post COVID-19
Source: Primary data, processed 2024.

Table 13. SPSS Model Summary output results.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0.606a	0.712	0.520	0.36455	0.011	0.491	4	172	0.743	2.521

a. Predictors: (Constant), Financial Capital, Empowerment post COVID-19, Social capital, Environmental physical capital
b. Dependent Variable: Social Resilience Post COVID-19
Source: Primary data, processed 2024.

is depicted as follows, according to the study findings shown in Tables 12 and 13:

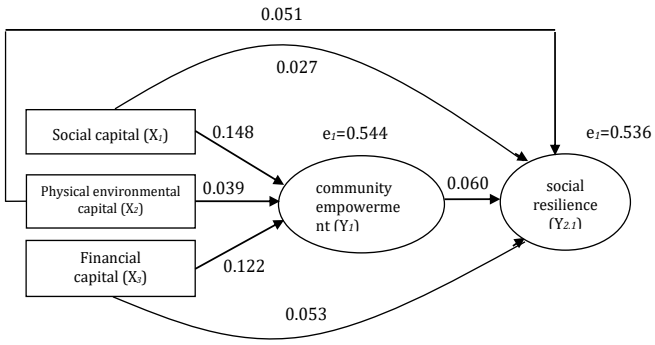

Figure 2. Social resilience model based on farmer empowerment in the coastal area of Deli Serdang Regency

Table 14's data analysis findings demonstrate how the usage of SPSS demonstrates the farmers' economic resilience in the coastal region of Deli Serdang Regency, North Sumatra Province.

The study results in Table 14 show that the post-COVID-19 pandemic community empowerment variable has a considerable beneficial influence on the economic strength variable of farmers in the coastal region of Deli Serdang Regency. The variable's significance value is 0.010 (t-sig) (<0.05). Further data analysis reveals that, in the coastal region of Deli Serdang Regency during the COVID-19 pandemic, the social capital factor significantly and favorably influences the economic resilience factor (t-sig <0.05; 0.039). The data analysis findings in Table 14 indicate that the economic strength variable of farmers in the coastal area of the Deli Serdang Regency has a positive but not statistically significant impact on the physical environmental capital variable following the COVID-19 pandemic. The physical environmental capital variable has a significant value of 0.530 (t-sig) (> 0.05). Consequently, a significance value of 0.036 (t-sig) (<0.05) suggests that, after the COVID-19 epidemic, the financial capital variable significantly and favorably influences the economic strength variable of farmers in the coastal region of Deli Serdang Regency. Table 15 displays the summary model of economic strengthening based on farmer empowerment, which is derived from the data analysis results.

The R Squarer value, as determined by the data analysis findings in Table 15, is 0.0830. This shows that after the COVID-19 epidemic, social capital, environmental capital, physical capital, financial capital, and community empowerment strengthened farmers' economies in the Deli Serdang Regency coastal region by 0.0830. The e2 value may be computed using the formula e2 = √ 1- 0.830 = 0.412. Figure 3 shows the schematic for the second model, which is the model of boosting farmers' economies in the coastal

Table 14. SPPS output results of the path coefficient model of farmer economic strength after the COVID-19 pandemic in the coastal area of Deli Serdang Regency.

Coefficients											
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**95.0% Confidence Interval for B**		**Correlations**		
		B	**Std. Error**	**Beta**			**Lower Bound**	**Upper Bound**	**Zero order**	**Partial**	**Part**
1	(Constant)	4.773	0.559		8,544	0.000	3,670	5.875			
	Empowerment post COVID-19	0.064	0.063	0.077	1,018	0.010	0.189	0.061	0.068	0.077	0.076
	Social capital	0.070	0.091	0.059	0.776	0.039	0.249	0.109	0.049	0.059	0.058
	Environmental physical capital	0.105	0.054	0.150	1,949	0.053	0.001	0.212	0.128	0.147	0.146
	Financial Capital	0.040	0.043	0.071	0.919	0.036	0.126	0.046	0.040	0.070	0.069

a. Dependent Variable: Economic strength post COVID-19
Source: Primary data, processed 2024

Table 15. SPPS output results of model summary coefficients

Model Summary[b]									
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Change Statistics**				**Durbin-Watson**
					R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**	
1	0.174a	0.830	0.008	0.26112	0.030	1,342	4	172	0.356	2,669

a. Predictors: (Constant), Financial Capital, Empowerment post COVID-19, Social capital, Environmental physical capital
b. Dependent Variable: Economic strength post COVID-19
Source: Primary data, processed 2024.

region of Deli Serdang Regency after the COVID-19 epidemic, based on the findings shown in Tables 14 and 15:

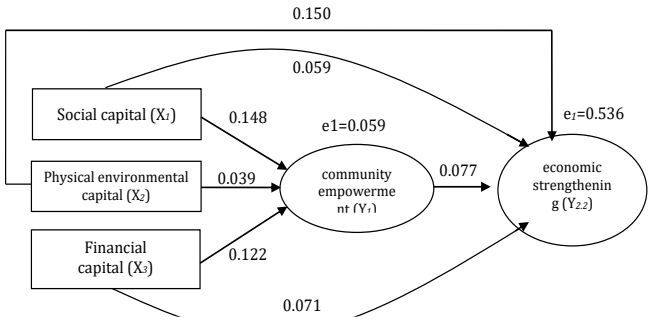

Figure 3. Economic strengthening model based on farmer empowerment in the coastal area of Deli Serdang Regency, North Sumatra Province

DISCUSSION

Authors should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted. The decision-making basis is as follows, as indicated in Table 3 of the Paired Sample Test, Based on the findings of the dataset analysis: 1) The COVID-19 outbreak has been really significant. on farmer empowerment in Deli Serdang Regency's coastal districts; the Sig. (2-tailed) value < 0.05; 2) The COVID-19 epidemic has no discernible impact on farmer empowerment in coastal Deli Serdang Regency if the Sig. (2-tailed) value > 0.05.

The conclusion that the COVID-19 epidemic substantially impacts farmer empowerment in Deli Serdang Regency is based on the Sig. (2-tailed) value in Table 3 Paired Samples Test being 0.000 <0.05. This study compares the level of farmer empowerment in the coastal region of Deli Serdang Regency before and after the COVID-19 pandemic. The findings revealed that the farmer empowerment programs in this area were significantly impacted by the COVID-19 outbreak. This is demonstrated by employing the criteria to ascertain the existence of a significant difference, which stipulates that Ha is denied if the Sig. (2-tailed) value exceeds 0.05 and accepted if it is less than 0.05. According to the statistical test results for the variable, Ha is accepted, as a significant difference is observed when the Sig. (2-tailed) value is less than 0.05, or 0.000 < 0.05.

Judging from the average, the average score for Empowerment during COVID-19 (EDC) is 3.8927, and the average score for Post COVID-19 Empowerment (EPC) is 4.2723, because the average value of post COVID-19 empowerment (EPC) is greater than the average value of Empowerment during COVID-19 (EDC) which is 3.8927, suggesting that the empowerment of coastal communities in Deli Serdang Regency was impacted by the COVID-19 outbreak. Therefore, it can be said that farmer empowerment in Deli Serdang Regency's coastline area varied before, during, and after the pandemic.

According to the data analysis findings in Table 6, the Paired Sample Test bases its decisions on the following criteria:1) The COVID-19 pandemic has considerably affected the social resilience of farmers in the littoral parts of Deli Serdang Regency, with a Sig. (2-tailed) value of less than 0.05; 2) A Sig. (2-tailed) value > 0.05 indicates that the COVID-19 epidemic has not significantly compromised the social resilience of coastal Deli Serdang Regency's farmers. The conclusion that the COVID-19 pandemic substantially influences farmers' social resilience in the coastal area of the Deli Serdang Regency is supported by the Sig. (2-tailed) value in Table 6 Paired Samples Test, which is 0.000 <0.05. It aims to distribute the social sharing of coastal regional agricultural communities of Deli Serdang Regency Province before and after the COVID-19 outbreak. Delicatessen Research and promotion showing that the socialization of agricultural communities of coastal farmers of Serdang District has been greatly impacted by the COVID-19 epidemic.

A hypothesis is accepted if its Sig. (2-tailed) value < 0.05 and rejected if it is more than 0.05, according to the criteria for assessing if a significant difference exists. Ha is acceptable as the statistical test results for the variable indicate that the Sig. (2-tailed) value is below 0.05, specifically 0.000 < 0.05. The average score for RPC (Social Resilience Post-COVID-19) is 4.3977, whereas the average score for RDC (Social et al. COVID-19) is 4.5751. Considering the average value of social resilience during the COVID-19 epidemic (RDC) as 4.5751, it is evident that there is a disparity in the social resilience of farmers in the littoral region of Deli Serdang Regency before and after the pandemic. This implies that the social resilience of farmers in the littoral region was compromised by the COVID-19 epidemic.

Table 9 presents the data analysis findings, which indicate that the Paired Sample Test makes decisions based on the following foundation: 1) A Sig. (2-tailed) value of less than 0.05 suggests that the economic resilience of farmers in the littoral districts of Deli Serdang Regency was substantially impacted by the COVID-19 pandemic; 2) Conversely, if the Sig. (2-tailed) value > 0.05, it suggests that the COVID-19 pandemic did not significantly affect the financial stability of farmers in these coastal areas of Deli Serdang Regency. The financial stability of coastal farmers in Serdang Regency has been severely harmed by the COVID-19 outbreak, according to Deligatessen Sig. The result in Table 9's paired sample test (2-tailed) is less than 0.000. This study's goal is to evaluate the financial standing of coastal farming communities in the Deli Serdang Regency before and after the COVID-19 outbreak. The findings of the study show that the financial stability of agricultural communities along the Deli Serdang

Regency's coastline was significantly impacted by the COVID-19 epidemic.

The following criteria were used to determine whether there were significant differences: Sig. (2-tailed) is accepted as an alternative hypothesis (Ha) if the value is below 0.05, and If the value is more than 0.05, Ha is rejected. The Ha variable is approved if the Sig. (2-tailed) is less than 0.05, according to the findings of statistical testing. Compared to the average score for economic strength after COVID-19 (ESPC), which is 4.4966, the average score for economic strength during COVID-19 (ESDC) is 4.3662. In the littoral region of Deli Serdang Regency, North Sumatra Province, the average economic strength disparity between cultivators before and after the COVID-19 epidemic is 4.4966. This implies that the financial viability of littoral producers in Deli Serdang Regency was impacted by the COVID-19 epidemic.

The results of this study indicate that things that cause disruption of social resilience and disruption of community economic resilience must be considered. This is consistent with the study's finding (Olshansky & Chang, 2009) which conveys the socio-economic impacts due to disasters must be addressed properly, which can be done by various parties such as; private institutions, communities, the world of education including the government in the context of socio-economic recovery of the community. Mehta, et al., (2020) conveying the efforts that can be made are; training, community empowerment (Furman et al., 2020), improving education and skills. (Jeong & Yoon, 2018) conveyed that the limitations of coastal communities, especially in accessing education and health services, make them increasingly vulnerable to socio-economic problems, in addition to the fact that their work patterns depend on the season, coupled with low quality human resources, limited access to capital, non-functioning institutions and limited social networks (Nainggolan & Ginting, 2019).

As shown by the study's results in Table 12, the social resilience variable in the coastal area of Deli Serdang Regency is significantly but favorably impacted by the post-COVID-19 pandemic community empowerment variable, Having a t-sig (significant value) of 0.027 (<0.05). In the coastal region of Deli Serdang Regency, the data analysis results indicate that the social capital variable significantly and positively impacts the social resilience variable during the COVID-19 pandemic. Additionally, the social capital variable's significance value is 0.023 (t-sig) (<0.05).

Data analysis after the COVID-19 outbreak in the coastal area of Deli Serdang Regency showed that the variability of physical violence had a significant value of 0.520 (t-sig) (> 0.05), with a positive but not significantly significant temperature. social efficiency factors. In the coastal area of Deli Serdang Regency, the financial capital variable has a substantial positive impact on the social resilience variable during the COVID-19 pandemic, with a significance value of 0.001 (t-sig) (<0.05). The data analysis findings shown in Table 12 further corroborate this.

According to Figure 2, social resilience (Y.2.1) is influenced by social capital (X1), financial capital (X3), and physical environmental capital (X2) via farmer empowerment (Y1). The indirect influence of social capital (X1) through farmer empowerment (Y1) is equal to the product of the beta value of the influence of social capital (X1) on empowerment (Y1) of 0.148 and the beta value of the influence of farmer empowerment (Y1) with social resilience (Y. 2. 1) of 0.060, or 0.008. Social resilience (Y. 2. 1) is directly influenced by social capital (X1) at a rate of 0.027. These results indicate that indirect social capital (X1) has a negligible effect on the social power of farmers in the coastal area of Deli Serdang Regency after the COVID-19 epidemic, with a direct influence of 0.027. With an indirect impact of 0.008, the direct effect is greater than the indirect influence.

According to Figure 2, social resilience (Y.2.1) is also known to be impacted by environmental physical capital (X2) via farmer empowerment (Y1). When the beta value of environmental, physical capital (X2) on empowerment (Y1) is multiplied by the beta value of the influence of farmer empowerment (Y1) on social resilience (Y. 2. 1) of 0.060, the result is 0.002, which is the indirect influence of environmental, physical capital (X2) through farmer empowerment (Y1). The direct influence of environmental and physical capital (X2) on social resilience (Y.2.1) is 0.051. In accordance with these calculations, the indirect effect is less significant than the direct influence, with the direct influence being 0.051 and the indirect influence being 0.002. Consequently, the social resilience of farmers in the littoral region of Deli Serdang Regency during the COVID-19 epidemic is minimally influenced by indirect environmental physical capital (X2).

It is also known from Figure 2 that social resilience (Y.2.1) is impacted by financial capital (X3) via farmer empowerment (Y1). The direct influence of financial capital (X3) on social resilience (Y. 2. 1). is 0.053, then the indirect influence of financial capital (X3) through farmer empowerment (Y1) is the multiplication of the beta value of financial capital (X3) on empowerment (Y1) of 0.053 with the beta value of the influence of farmer empowerment (Y1) on social resilience (Y.2.1) of 0.060, which is 0.003. According to these estimates, the indirect effect is less important than the direct influence, with the direct influence being 0.0531 and the indirect influence being 0.003. The social power of farmers in the coastal region of Deli Serdang Regency after the COVID-19 epidemic is thus assumed to be unaffected by financial capital (X3).

The study's findings suggest that enhancing farmers' social resilience in coastal regions requires a strong emphasis on their financial capability, natural capital, and social capital. The findings of this research are consistent with (Dunggio et al., 2021) who assert that the presence of human resource

capability, institutions, and networks of coastal farmers is necessary to enhance farmers' social resilience. Furthermore (Wiguna & Ketut, 2019) stated that poor public welfare, especially during disasters such as the COVID-19 pandemic, is influenced by social resilience. (Delima et al., 2016) conveyed that building social resilience of farmers is a must so that farmers have the ability to maintain their condition against economic uncertainty. Strengthening social resilience is inseparable from the influence of government policies and programs (Elrick-Barr et al., 2024), community asset ownership, income, including social capital (Teräs, 2019), and social change, so efforts are needed to continuously increase social resilience.

According to Figure 3, the economic strength of farmers (Y.2.2) is influenced by social capital (X1), financial capital (X3), and physical environmental capital (X2) via farmer empowerment (Y1). Social capital (X1) directly impacts farmers' financial stability (Y.2.2). 0.059, the indirect impact of social capital (X1) on farmer empowerment (Y1) is equal to the product of the beta value of the influence of social capital (X1) on empowerment (Y1) of 0.059 and the beta value of the influence of farmer empowerment (Y1) with social resilience (Y. 2. 1) of 0.077, or 0.004. Our estimates indicate that during the COVID-19 epidemic, farmers' financial well-being in the coastal area of Deli Serdang Regency was not significantly impacted by indirect social capital (X1). The direct impact is 0.059, whereas the indirect influence is 0.004. The direct influence is thus more significant than the indirect one.

The economic strength of farmers (Y. 2. 1) is also known to be influenced by environmental physical capital (X2) via farmer empowerment (Y1), as seen in Figure 3. The indirect impact of environmental, physical capital (X2) through farmer empowerment (Y1) is equal to the product of the beta value of the influence of farmer empowerment (Y1) on farmers' economic strength (Y.2.2) of 0.077 and the beta value of environmental, physical capital (X2) on empowerment (Y1) of 0.039. As a consequence, X2 has a direct impact of 0.150 on economic strength (Y.2.2). As per these estimates, the indirect effect is less significant than the direct influence, with the direct influence being 0.150 and the indirect influence being 0.003. Consequently, it can be concluded that the economic power of farmers in the littoral region of the Deli Serdang Regency is substantially influenced by indirect environmental physical capital (X2).

Based on Figure 3, it is also known that the influence of financial capital (X3) through farmer empowerment (Y1) on the economic strength of farmers (Y.2.2). The direct influence of financial capital (X3) on economic strength (Y. 2. 2). is 0.071, then the indirect influence of financial capital (X3) through farmer empowerment (Y1) is the multiplication of the beta value of financial capital (X3) on empowerment (Y1) of 0.053 with the beta value of the influence of farmer empowerment (Y1) with social resilience (Y.2.1) of 0.077, which is 0.004. These findings show that indirect financial capital (X3) after the COVID-19 epidemic had no effect on farmers' economic power in the coastal area of Deli Serdang Regency. 0.053 is the direct effect, while 0.004 is the indirect influence. This implies that direct influence has a greater impact than indirect influence.

The results of this study are supported by research (Fan et al., 2019) which claims that the system's and society's economic potential to adjust to shocks with the help of social capital and farmer finances is known as economic resilience. Even Febriyanti et al. (2021) conveying economic resilience describes the stability of economic recovery with indicator; per capita income of farmers, ownership of social capital, sufficiency of income to meet daily needs, including financial security (Shahreza and Lindiawatie, 2020). Furthermore Hao et al. (2023) stated that the economic resilience of farming communities also depends on the condition of farmers' food security, which includes resilience to crises against falling food prices in the market and adaptive resilience to rising food prices.

Strengthening the economy of farming communities in coastal areas is conceptually related to programs that are sustainable in nature by involving various parties, social systems, including social institutions (Rela et al., 2020). Due to the impact of the COVID-19 pandemic on various aspects globally, various countries have also undertaken a recovery process. In Nigeria, a socio-economic recovery process from the shocks is also being carried out to build sustainable economic growth post-COVID-19, which is strong, inclusive and paves the way for achieving the SDGs by 2030. Socio-economic strengthening, prioritizing the most vulnerable groups in society, and ensuring sustainability. service delivery, including humanitarian response, by strengthening community capacity for resilience and recovery. Policy responses and interventions are carried out flexibly and based on evidence to meet emerging needs and short-, medium- and long-term implications (UNDP, 2020).

Good practices in the socio-economic recovery process in Nigeria also focus on target groups, including women, older people, people with disabilities, migrants/refugees, and people in correctional facilities and other detention or rehabilitation centers, among others (UNDP, 2020). In the long term, further research will be conducted to evaluate the social recovery and economic development programs for coastal farmers carried out by various parties. The economic recovery program will be approached with a socio-economic approach based on several elements, such as farmer empowerment conditions, farmers' ability to survive socially and economically in disasters that are prolonged in nature.

***Conclusions*:** The study's findings suggest that: a) the COVID-19 pandemic significantly affected the empowerment of coastal communities, evidenced by the variations in farmer empowerment in Deli Serdang Regency's

coastal region before and after the outbreak; where; empowerment post pandemic is better with an average score of 4.2723, higher than during the COVID-19 pandemic with an average score of 3.8927; social resilience after the COVID-19 pandemic is better with an average score of 4.5751 compared to the pandemic period with an average score of 4.3977 and economic strength of farmers after the pandemic is better with a value of 4.4966, better than during the pandemic with a value of 4.3662; b) the pandemic influenced the social resilience of farmers in these coastal areas, as indicated by the differences observed in their social resilience in Deli Serdang Regency pre- and post-epidemic; c) the economic resilience of coastal communities was also impacted, with noticeable differences in farmers' economic standing in the region before and after the pandemic; d) through the perspective of farmer empowerment, social capital, financial capital, and physical environmental capital influenced farmers' social resilience during the COVID-19 epidemic in the coastal regions of Deli Serdang Regency; e) in the same region, social capital, physical environmental capital, and financial capital collectively played a role in enhancing farmers' economic resilience amid the pandemic. In light of these findings, it is recommended that the government empower coastal communities in a strategic and sustainable manner to bolster social and economic resilience by effectively utilizing the community's resources, including social, environmental, and financial capital.

***CRediT author statement*:** For research articles with multiple authors, a short paragraph stating their respective contributions should be included. All authors conceptualization, methodology, Hotden L. Nainggolan; software, validation, Hotden L. Nainggolan, formal analysis, Albina Ginting, resources, Susana Tabah Terina, data curation, Hotden L. Nainggolan, writing original draft preparation, Albina Ginting, writing review and editing, visualization, Hotden L. Nainggolan. And all authors have read and approved the published version of the manuscript.

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***Ethical statement*:** This research was conducted in accordance with scientific ethics, was non-discriminatory and paid attention to preserving nature and the environment.

***Informed consent*:** N/A

***Consent to participate*:** All authors participated in this research study.

***Consent for publication*:** All authors submit consent to publish this research article in the Journal of Global Innovations in Agricultural Sciences.

***SDG's Addressed*:** Empowering farmers, Strengthening social, Promoting economic resilience, Improving the welfare of coastal farmers, Developing sustainable agriculture.

***Policy referred*:** Farmer Empowerment Policy; Coastal Community Development Policy ; Post-COVID-19 Economic Recovery Policy.

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